

**SIDEWALL FUNCTIONALIZATION OF SINGLE-WALL CARBON NANOTUBES  
THROUGH C-N BOND FORMING SUBSTITUTIONS OF FLUORONANOTUBES**

**ABSTRACT**

The present invention is directed toward a method of sidewall-functionalizing single-walled carbon nanotubes (SWNTs) through C-N bond forming substitution reactions with fluorinated SWNTs (fluoronanotubes), and to the sidewall-functionalized SWNTs comprising C-N bonds between carbons of the SWNT sidewall and nitrogens of the functionalizing groups made by these methods. Furthermore, when diamine species are utilized as reactants, novel materials like crosslinked SWNTs and “nanotube-nylons” can be generated.

In some embodiments, SWNTs with functional groups covalently attached to their side walls through C-N bonds are prepared by either the direct interaction of fluoronanotubes with terminal alkylidene diamines or diethanolamine, or by a two-step procedure involving consecutive treatments with  $\text{Li}_3\text{N}$  in diglyme and  $\text{RCl}$  ( $\text{R} = \text{H}$ , n-butyl, benzyl) reagents. Evidence for sidewall attachment of amine-derived groups has been provided by Raman, FTIR, and UV-vis-NIR spectra, SEM/EDAX and TEM data, and thermal degradation studies. The demonstrated new C-N functionalization methods offer a wide range of further SWNT derivatizations, including their covalent binding to aminoacids, DNA, and polymer matrixes.